Geochemistry of Late Mesozoic Mafic Dykes in the Sulu Orogenic Belt, China: Constraints on the Mantle Source

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Mesozoic igneous rocks are widely distributed in the Qinling-Dabie-Sulu orogenic belt, China. Either post-collision related or Paleo-Pacific plate subduction related has been proposed for a tectonic scenario of their formation. Here we report zircon U-Pb ages and geochemistry and Sr-Nd-Pb isotopes of Cretaceous dykes of intermediate to mafic composition exposed in the Sulu belt, to examine nature of the mantle source and evolution of the lithospheric mantle beneath the Sulu belt during the Late Mesozoic time.

Geochemically, the dykes in the Sulu area belong to high-K calc-alkaline to shoshonitic series. Zircon U-Pb dating constrains their emplacement time of 107 to 118 Ma. The mafic dykes are characterized by high MgO, Cr and Ni contents. In contrast, the intermediate dykes have relatively low MgO, Cr and Ni contents. Intermediate and mafic dykes all show enrichment in LILEs, LREEs and depletion in HFSEs, HREEs without significant Eu-anomaly. Both types of dyke have similar isotopic composition significantly with negative initial ε_{Nd} values and high radiogenic $^{87}Sr/^{86}Sr$ ratios and less radiogenic Pb composition. Initial $^{87}Sr/^{86}Sr$ ratios and initial ε_{Nd} values of the dykes keep unchanged with the changing $Mg^{\#}$, pointing to insignificant contamination of crustal material during the magma ascent. Based on the results, the mafic dykes were likely the products of partial melting of enriched mantle forming by the recycle of continental crust during the convergence between the South and North China blocks in Triassic. The contemporaneous intermediate dykes originated from more evolved magma(s), probably resulting from fractional crystallization of the parental magma(s). Partial melting might happen in a back-arc extensional setting caused by the Paleo-Pacific subduction.